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Ways of Increasing the Stability of the Air Defense System of the Country

by Colonel I. Trubarov

There is no doubt that our probable enemy will take the most varied forms of action against our air defenses in order to overcome them, such actions, for example, as using fire power to destroy individual elements of our Air Defense system, neutralizing radar and communications means with different kinds of jamming, putting out of action individual Air Defense installations through sabotage groups, and others (direct action). In addition, if nuclear missile strikes are mounted against targets in our country, the Air Defense troops located near them may suffer indirect losses from these strikes (indirect action).

Under such conditions, the achievement of a high degree of stability in our Air Defense system is a key problem, on whose solution the reliability of the defense of important installations of our country to a large extent depends.

It must be stressed that the problem of the stability of our Air Defense system has not yet been adequately worked out. There is as yet not even unity of views on interpreting the concept.

Sometimes the substance of this problem can be reduced to a question of viability. In other instances, stability of air defenses, like that of ground defenses, is identified with invincibility. To proceed from this premise would mean that Air Defense troops should have the capability for the complete destruction of all means of aerospace attack. But such a task, as is well known, is beyond the capability of Air Defense troops, at least for the present and the immediate future. If it is impossible to create an invincible air defense, however, then how can its stability be increased and what is included in this concept?

By stability of the Air Defense system we mean that characteristic of the system which is concerned with the capability of Air Defense troops to fulfil their assigned missions for defending installations and areas of the country under conditions of massive use by an enemy of weapons of mass destruction.

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The stability of the Air Defense system depends on various factors, including the number of Air Defense forces and means on each axis and their structure, the combat readiness of the troops, the reliability of the command system, and many others. There are probably very few measures which could be taken with the troops which would not have a corresponding effect on the stability of air defenses. However, among the numerous approaches to the solution of this problem, we can single out three which are of decisive significance.

THE FIRST APPROACH--THE ACHIEVEMENT OF MAXIMUM EFFECTIVENESS OF THE AIR DEFENSE SYSTEM

It is obvious that the more enemy means of attack the Air Defense troops can destroy in space and in the air, the fewer will strike our installations being protected and the troops defending them. In other words, the more effective our air defense, the more stable it will be.

The creation of a sufficiently effective, and therefore stable, air defense is one of the principal and most difficult tasks of military organization.

The effectiveness of our air defense depends on the quality of the air defense means available to the troops; on the rational structure and continuous improvement of the Air Defense system and the skilful use of Air Defense troops in combat; on the means and methods for troop control; on the combat readiness of the troops; and on other factors.

Let us look briefly at the influence of these factors on the effectiveness of air defense.

First of all, the quality of armament. It is known that the effectiveness of air defense today has increased greatly over that of World War II. This was achieved through pronounced improvement in air defense means, resulting mainly from the creation of basically new means for combat with aircraft: antiaircraft missile systems and aircraft missile equipment for intercepting air targets. The antiaircraft defense means comprising the armament of Air Defense troops possess excellent combat qualities. They are capable of effective combat with existing aerodynamic means of attack as well as with projected ones.

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However, now that ballistic missiles have become the basic means of delivering nuclear weapons to their strike targets (space devices may be the delivery vehicles in the future), new and greater demands are being made on air defense means. The weapons of air defense today must be able not only to destroy all types of aerospace means of attack (ballistic missiles, space vehicles, aerodynamic vehicles, and balloons) when used in mass quantities, but also to neutralize (destroy) nuclear charges by shooting down their delivery vehicles. Only with highly effective air defense means can a really stable air defense be created.

As is well known, the basis of any defense, air defense in particular, is the principle of the concentration of the main forces along the decisive axes and in positions to defend the most important areas.

The degree of importance of the areas and installations to be defended and their location within the country are extremely varied. Thus, if we divide the country into four zones for purposes of discussion--European, including the Urals and the Transcaucasus (first zone), Siberia (second), Far East (third), and Central Asia and Kazakhstan (fourth)--and compare them with one another, it is not difficult to detect that the significance of these zones and the economic regions within them is far from being equal. In the first zone are concentrated seventy-seven percent of the population and thirteen of the eighteen industrial areas of the country; the second zone--eight percent of the population and two industrial areas; in the third zone--two percent of the population and one industrial area; and in the fourth zone--thirteen percent of the population and two industrial areas.*

It must also be borne in mind that different areas and installations within the separate zones are also of unequal significance. Of all the industrial areas of the Soviet Union, the Central Industrial Area occupies a special position, being at once the principal economic nucleus, the leading industrial base, and the center of scientific and technical progress of our country.

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*USSR, 1917-1967, Encyclopedia Handbook. The Soviet Encyclopedia Publishing House, 1967, page 261.

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For a deeper analysis of the importance of the zones, areas, and installations of our country it is of course necessary to conduct a comprehensive evaluation, taking into account their military significance. Even from such an incomplete evaluation, however, it is evident where we must concentrate the main groupings of Air Defense Troops of the Country. With the correct distribution of Air Defense forces and means in the zones, areas, and installations to be defended, the combat capabilities of groupings of Air Defense troops will be exploited more fully, and, consequently, the effectiveness of our air defense will be at the maximum.

At the same time, the correct distribution of Air Defense forces and means in the zones of the country will not in itself solve the problem of increasing the effectiveness of air defense. It is of crucial importance that the groupings of Air Defense troops in these zones have a rational structure. Given the same number of Air Defense troops, the effectiveness of the Air Defense system will rise in direct proportion to the amount of time available to the Air Defense forces and means to take action against the enemy. Therefore, the preferred variant for creating groupings of Air Defense troops is the one which assures the maximum depth of defense. For this purpose, we should strive, in building up and perfecting our Air Defense system, to extend the sphere of combat actions of the active Air Defense means as far as possible in the direction of the enemy.

An important condition for raising effectiveness is the continual development and improvement of the Air Defense system in connection with periodic acquisition of new air defense means by the troops. A good example of this is antiaircraft defense. Thus, in the first stage, when the armament of Air Defense troops included intermediate- and short-range combat means with extremely low combat effectiveness against cruise missiles, we created a defense that was primarily installation-oriented and partly zone-installation oriented.

The second stage of air defense development began with the acquisition by the Air Defense troops of new means, such as long-range surface-to-air missile systems and long-range intercept aircraft missile systems. This stage brought the creation of zone defense and the perfection of zone-installation defense. The difference in the antiaircraft defense created in

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the second stage is that it was dedicated first and foremost to combat with cruise missiles and their delivery vehicles.

Calculations show that by using a relatively small number of long-range surface-to-air systems it is possible to have complete (zone) defense of the installations and areas of the first zone of the country (European part, Urals) against strikes by cruise missiles and piloted aircraft, from the northern, northwestern, and western air axes. This increases the effectiveness of the air defense of our country to a significant degree.

Because of the wide dispersal of areas and installations, it is obviously impossible to have zone defenses in the other zones of the Soviet Union even if long-range systems are available. The installation-oriented defense existing in these zones can be strengthened by reinforcing already created groupings of Air Defense troops with units having long-range systems.

Fighter aviation regiments armed with long-range intercept systems occupy an important position in the effectiveness of air defense. The correct use of these fighter aviation regiments in the Air Defense system of the country makes it possible not only to enlarge the depth of defense but--the main concern--to destroy enemy missile-carrying aircraft before they reach the launch lines for their cruise missiles. The principal areas of combat use of long-range interceptor air units are the Polar region and the Arctic, i.e., the areas nearest the enemy, from which we must expect mass strikes by his missile-carrying aircraft.

Thus, the most important ways of perfecting antiaircraft defense in connection with the introduction of new long-range means into the Air Defense troops are by increasing the depth of defense, creating zone defenses on the main air axes, and strengthening zone-installation and installation defenses.

In order to increase the depth of air defense, we must have a grouping of long-range interceptor air regiments in the first echelon of the Air Defense formations deployed on the main air axes. These units must be based at airfields as close as possible to the probable axes of flight of missile-carrying aircraft; this will assure the destruction of aircraft which are carrying guided missiles before they reach their missile launch lines.

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Units of antiaircraft missile troops armed with multichannel long-range systems must comprise the basis of the antiaircraft missile defense of dense concentrations of industrial-economic areas and installations. These units will be called upon to ensure the zone defense of these areas and installations, above all, from strikes by cruise missiles. In some cases they can be used to strengthen the installation defenses of individual installations.

As is known, the most important requirement of troop control in air defense is to ensure the fullest and most rational use of their combat potential. But under modern conditions this is achievable only through the automation of control.

As experience shows, the most substantial increase in the effectiveness of our Air Defense system is achieved through full automation of the processes of troop control at the tactical level, where the tasks of indirect control of active means are worked out. As regards automation at the operational level, it is sufficient to have an incomplete or even partial degree of automation of the processes of control, i.e., with automation of only the output, transmission, and collation of radar information and the transmission of control orders. It is not necessary to automate the processes of target allocation at the operational command level, since this function is fulfilled at the tactical level.

It is convincingly demonstrated by the research of scientific organizations and by actual troop practice that if control at the tactical level is fully automated, and even partially automated at the operational level, the combat effectiveness of a given grouping of troops will be two to three times greater. Thus, automation of Air Defense troop control represents above all a gain in the effectiveness of the Air Defense system and, consequently, of its stability.

The enemy will strive in all instances to achieve surprise in his actions. However, a surprise strike by his aerospace means can be ruled out if the Air Defense troops are in a sufficient state of readiness to assure the prompt and organized commitment of all Air Defense forces and means for the destruction of the enemy in the designated areas.

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It is perfectly obvious, however, that it is a practical impossibility to keep the entire Air Defense system at the maximum state of readiness over a long period of time, and the duty forces and means of Air Defense can accomplish only limited objectives during the repulsion of a surprise massive strike. Special attention must therefore be given to finding ways of shortening the time needed to bring Air Defense forces and means to a state of readiness, both those which are on duty and, particularly, those which are not. We would like to note at the same time that it is very important in solving this problem to have a correct idea of the approach time of enemy aircraft and to calculate it skilfully.

This is all the more important because there are incorrect interpretations of this problem. For example, approach time is sometimes defined as the flight time of aircraft from their bases to their strike targets. But such a definition is unacceptable for the Air Defense Troops of the Country, since it does not express the connection between the possibility of a surprise enemy strike and the readiness of the troops to repulse it. This could lead to overestimating the time needed to bring Air Defense troops to a state of readiness, and as a result, not all the forces and means might be able to participate in repulsing the enemy air attack.

In order to reveal this connection and correctly define the preparation time for air defense means, which must naturally be less than the approach time, the approach time must be reckoned not from the takeoff of the aircraft or the launching of ballistic missiles but from the time they are actually detected by our reconnaissance (radar, radiotechnical, space, and other reconnaissance means) up to the time the active air defense means receive the order to destroy them.

Let us explain this with an example. In order to destroy a B-52 in flight toward a target which is defined by an S-75 [SA-2] antiaircraft missile regiment, a missile battalion must be assigned to destroy this aircraft when it is not nearer than one hundred kilometers to the battalion's launch position. Let us assume that this bomber is detected by reconnaissance radar at a distance of five hundred kilometers from the launch position of the battalion assigned to destroy it; that its flight speed is fifteen kilometers per minute; and that the elapsed time [redacted] 50X1-HUM he

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detection of the aircraft to the receipt of the order to destroy it does not exceed three minutes. In this case, the aircraft's approach time for the battalion will equal

$$\frac{550 \text{ km} - 100 \text{ km}}{15 \text{ km/min}} - 3 \text{ min} = 27 \text{ min.}$$

Therefore, the antiaircraft missile battalion will be able to destroy this aircraft if the battalion can be brought to combat readiness in less than twenty-seven minutes.

The state of readiness of Air Defense troops may, of course, vary for different groupings, since the approach time of an air enemy will not be the same for all of them. For example, for Air Defense units deployed in the first line of border and coastal Air Defense formations, the time will be five to ten minutes; for formations of the second echelon, thirty to sixty minutes; and only for the small portion of large units deployed in the interior of the country, two to three hours.

The approach time, and therefore also the time needed to bring the Air Defense troops to a state of readiness for combat actions, can be increased by extending outward the perimeter for detecting enemy aircraft. This can be achieved by the use of long-range radar stations in the first line of deployment of radiotechnical troops and, on maritime axes, radar patrol aircraft and ships. Thus, a P-14 [TALL KING] radar station assures the detection of air targets at medium and high altitudes at a distance of four hundred to six hundred kilometers, and the continuous tracking of B-52 bombers for fifty minutes and of "Hound Dog" cruise missiles for twenty minutes, which is entirely adequate for bringing Air Defense duty forces and means, and part of those which are not on a duty status, to a state of combat readiness for commitment to combat. In the "Sky Shield" training exercise, the depth of detection of an air enemy on the northern axis was increased up to four hundred to five hundred kilometers by having only three aircraft and two ships on radar patrol, and to six hundred to seven hundred kilometers with the addition of land-based radar reconnaissance facilities. Such a depth of detection of air means of attack assures us of fifty to sixty minutes in which to bring our Air Defense forces and means to combat readiness.

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THE SECOND APPROACH IN INCREASING THE STABILITY OF THE AIR DEFENSE SYSTEM--ASSURING THE MAXIMUM DEGREE OF VIABILITY

High viability of troop groupings forms the basis of any defense. Viability should not be understood here as striving for self-preservation or for survival in general. Viability is above all the assurance of the preservation of combat capability by troops under enemy strikes. The indicator of the viability of the Air Defense system is the degree to which the combat capability of troop groupings is preserved under conditions of strong enemy action against the elements of the system.

The principal measures for assuring the viability of Air Defense troops are: expedient echeloning and dispersal of troops and materiel-technical means; engineer preparation of the elements of combat formations; advance creation of reserves of combat equipment at sites and airfields; increasing the capabilities of autonomous existence of each Air Defense garrison; and others.

As shown by research and testing, engineer structures, even of an exposed type (trenches, shelters), reduce the effect of a shockwave on combat equipment by a factor of two or three. Thus, missile guidance stations, radar stations, and vans located in trenches and shelters will suffer no damage from a shockwave of up to one kilogram per square centimeter, whereas in exposed locations they are put out of action by overpressure of 0.2 to 0.3 kilograms per square centimeter. Personnel shelters reduce the effect of a shockwave by a factor of seven and more. Therefore, it is vital to the further increase of the viability of our Air Defense system to proceed with the improvement of engineer support for combat dispositions of troops and to construct personnel shelters, protected command posts, and other installations. Completion of these engineer structures should ensure the defense of personnel and combat equipment from the destructive effects of nuclear, chemical, and bacteriological weapons and should make possible the extended and uninterrupted conduct of active combat operations.

Not all elements of combat equipment can be sheltered in trenches and structures, however. For instance, the antenna systems of missile guidance stations and radar stations can operate only in exposed locations, and they are by their nature

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much more vulnerable than vans and launch installations. The overpressure needed to destroy the antenna systems is equal to 0.1 kilograms per square centimeter. The existence of antenna systems in many elements of troop combat dispositions means one of the most vital tasks confronting Air Defense troops is to ensure the viability of antenna systems. This problem cannot be solved constructing protective covers for antennas, since this produces only the very insignificant increase in stability of from 0.1 to 0.3 kilograms per cubic centimeter. In connection with this, one of the approaches to increasing the viability of the Air Defense system is the advance construction of reserve antenna systems; and a future approach is a change in design, i.e., the creation of slot antennas.

The viability of radiotechnical troops whose positions include companies (battalions) with several radar stations is increased by protecting them with shelters of the shaft or dugout type. If a nuclear/missile strike is expected, some of the radar units are dismantled and placed under cover, to be set up again prior to an air attack.

The Air Defense troops have a large amount of their combat equipment in vehicles, trailers, and semi-trailers on whose faultless performance the success of combat operations depends to a great extent. Considering that the majority of these vehicles are serviced by personnel who must be defended from penetrating radiation and other destructive aspects of nuclear/missile weapons, we must place them in shelters of the dugout type with a thick protective covering made to look like ordinary earth.

An important element in increasing the viability of antiaircraft missile troops is protecting missile magazines. Surface magazines can withstand a shockwave overpressure of 0.15 kilograms per square centimeter, while launch installations and their missiles in dugout trenches can survive overpressure on the order of 0.6 to 0.7 kilograms per square centimeter. A slight increase in the forces and means used in the construction of such structures would make it possible to build semi-buried ones, which would significantly improve the protection of missiles kept at launch sites.

The dispersal and echeloning of troops and materiel-technical means acquire great importance in assuring the viability of the

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Air Defense system. They are accomplished mainly by setting up the Air Defense system to correspond to basic troop structure. Thus, antiaircraft missile troops are most often deployed by battalions at launch and technical positions; radiotechnical troops, by companies and battalions; and fighter aviation, usually one regiment per airfield.

Further dispersal is carried out during the course of heightening and completing the combat readiness of Air Defense troops. Particular attention here should be given to the basing of aircraft and to the dispersal of materiel-technical means which are least dispersed at present.

The basic requirement in the dispersal of materiel-technical means in the Air Defense troops is that they be kept directly at airfields and positions and not in any special rear area locations. It is necessary that every Air Defense unit and small garrison be able to carry on combat for several days without being resupplied with basic materiel or munitions, and each should have a month reserve of various types of provisions.

The most vital condition for the successful fulfilment of combat objectives is that there be an increase in the capabilities of each separate Air Defense garrison (regiment, launch battalion, technical battalion, company) toward an autonomous state and the preservation of combat capability under conditions of massive employment by the enemy of weapons of mass destruction.

THE THIRD APPROACH IN INCREASING THE STABILITY OF THE AIR DEFENSE SYSTEM--THE RAPID RESTORATION OF DISRUPTED AIR DEFENSES

Calculations show that direct and indirect troop losses in Air Defense formations from an initial enemy massive nuclear strike (missiles and aircraft) may reach twenty-five to forty percent. If we take total losses as one hundred percent, then the losses from a strike by ballistic missiles may reach fifty to sixty percent of the total, while the effectiveness of the Air Defense system will be reduced by twenty to thirty percent. As a result, the Air Defense system will have breaches and sectors and axes where the effectiveness of troop groupings is lowered. In some areas the main and reserve airfields, antiaircraft missile and radiotechnical positions, command posts, and other

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Air Defense elements may be destroyed or exposed to radioactive, chemical, and bacterial contamination. All of this may make combat with the enemy considerably more difficult and will require special measures for restoring the Air Defense system. From this it must be concluded that the capability of the troops to rapidly restore the Air Defense system is the most vital condition for maintaining its stability.

The restoration of the Air Defense system includes a series of measures directed toward the uninterrupted maintenance of the system at a functioning level equal to its former level of effectiveness or to a newly assigned level of effectiveness. Restoration of the Air Defense system does not mean the full restoration of all of its elements and groupings, but means rather the restoration of the system to the optimal condition for defending those installations which are still important after an initial enemy strike, in order to prevent a second and subsequent strikes on them.

The restoration of the disrupted Air Defense system is an integral part of troop combat actions. It will begin immediately after the first losses, continue in the intervals between strikes and during combat actions, go on continuously, and have as its goal the restoration of troop combat capability and the overall defense system.

Air Defense formations themselves can restore up to fifteen to twenty percent of their losses resulting from a nuclear/missile strike. This is achieved through the repair and restoration of combat equipment, the use of reserves, the regrouping of troops, the commitment of subunits deployed in covered positions, etc.

However, on individual axes and installations to be covered, the troops will not have sufficient capabilities for restoring the Air Defense system by their own efforts alone, and it will be necessary to reinforce these troop groupings with reserves from the High Command. It therefore appears advisable to project possible losses in all situations while we are still at peace and to create the necessary reserves.

We may conclude from the foregoing that only a comprehensive solution of all the problems comprising each of the approaches we have elaborated for increasing the stability of the Air Defense system can lead to the practical resolution of the problem as a whole.

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